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FOSSIL FERNS FROM THE LARAMIE GROUP OF COLORADO.*

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(Plates 3 and 4)

Some twelve or thirteen years ago an extensive collection of fossil plants, from the Laramie (Upper Cretaceous) Group of Colorado, was made by Messrs. George Hadden and R. C. Hills, for the late Dr. J. S. Newberry. This collection is now in the paleobotanical museum of the New York Botanical Garden, and, although partly labeled, was never reported upon by Dr. Newberry.

Included in the collection are a few ferns, most of which are more or less rare and some of them apparently represent undescribed species or varieties. Of these the following have been selected as noteworthy:

Anemia supercretacea sp. nov.

General form of frond, also nervation, unknown; pinnae delicate, narrowly conical in outline, gradually tapering to the tips; pinnules entire, lower ones spatulate, distinct, somewhat decurrent along and forming acute angles with the rachis, upper ones often more pointed or becoming confluent and forming toothed or crenulated tips to the pinnae. Plate 3, Figs. 6, 7.

In reddish shaly sandstone, Florence, Colo.

Anemia robusta sp. nov.

General form of frond, also nervation, unknown; pinnae (?) linear in outline, about 3 cm. in width; pinnules entire, ovate to subspatulate, with blunt wedge-shaped tips, about 2.5 cm. in

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length by 12 mm. in width, more or less confluent or decurrent along the rachis, each one provided with a weak midvein. Plate 3, Fig. 1.

In grayish sandstone, Florence, Colo.

ASPLENIUM MAGNUM Knowlton, Monog. U. S. Geol. Surv. **32**: 667. *pl. 79. f. 5–8a*

I have figured these specimens for the reason that they show some slight differences or variations from the type figured by Knowlton. In ours the pinnae are more deeply dissected, so that the pinnules are more distinctly separated and are merely confluent close to the rachis. They are also somewhat more pointed and falcate in outline. Plate 4, Figs. 1, 2.

In general appearance they both resemble *Aspidium Kennerleyi* Newb. (Boston Jour. Nat. Hist. **7**: 513. 1863; Monog. U. S. Geol. Surv. **35**: 11. *pl. 16. f. 4, 5.* 1898), which differs chiefly in the pinnules, for the most part, being finely denticulate near their extremities, although "sometimes entire," according to the description.

Fig. 1 in reddish shaly sandstone, Fig. 2 in black carbonaceous shale, Florence, Colo.

Acrostichum Haddeni sp. nov.

General form of frond unknown; pinnae (?) apparently 20 cm. or more in length by about 3 cm. in maximum width, narrowed to acute tips and with coarsely crenulate-serrate margins; nervation consisting of a series of alternate pinnately arrranged veins, extending from the rachis to the extremities of the serrations, with the spaces between occupied by a network of fine nerves. Plate 4, Figs. 3–6.

Named for Mr. George Hadden, the collector.

Figs. 3, 5 and 6 in grayish sandstone, Walsenberg Colo.; Fig. 4 in gray shale, Florence, Colo.

Polystichum Hillsianum sp. nov.

General form of frond unknown; pinnae (?) linear-oblong in outline, about 3 cm. in maximum width, narrowed to 18 mm. at the base, deeply pinnatifid; pinnules entire, linear to subfalcate in outline, blunt-pointed or obtuse at apex, alternately disposed and confluent along the rachis; nervation pinnate, consisting of

a series of primary nerves extending from the rachis to the extremities of the pinnules and numerous secondary nerves, once forked. Plate 4, Fig. 7.

Named for Mr. R. C. Hills, largely through whose efforts the collection was acquired.

In reddish shaly sandstone, Florence, Colo.

Gleichenia rhombifolia sp. nov.

General form of frond, also nervation, unknown; pinnae linear in outline, acute, about 5 mm. in width, composed of subquadrate pinnules, the lower ones distinct, acute and curved inward at the tips, the upper ones becoming confluent or closely approximated and all of nearly uniform length, giving to the pinnae a delicate, ribbon-like appearance. Plate 3, Fig. 3.

In reddish shaly sandstone, Florence, Colo.

GLEICHENIA DELICATULA Heer (?), Fl. Foss. Arct. 3^2: 54. *pl. 9. f. 11e; pl. 10. f. 16, 17*

This specimen agrees quite satisfactorily with Heer's Fig. 11e above quoted, but not so closely with his other figures, which show pinnae broader at their bases and not so uniform in width throughout as in ours. Further than this, if we determine these to be identical this determination would infer a very extensive vertical range for the species, a range which we would hardly be justified in assuming without question, upon such meager evidence as that afforded by the single fragment represented by our specimen, although there would be no inconsistency in identifying a species from the Kome beds with one from the Laramie. Plate 3, Fig. 4.

In reddish shaly sandstone, Florence, Colo.

PECOPTERIS (CHEILANTHES) SEPULTA Newb. (?) Monog. U. S. Geol. Surv. **35**: 12. *pl. 62. f. 5, 5a, 6.* 1898

Pecopteris (*Phegopteris*) *sepulta* Newb. Proc. U. S. Nat. Mus. **5**: 506. 1883.

After some hesitation I have finally decided to refer our specimen provisionally to this species. The differences are slight and the resemblance is so close that a distinction seems hardly to be warranted. Plate 3, Figs. 5, 5a.

Newberry's figures show the pinnae at the extremity of the frond to be either entire or wavy-margined and confluent along the rachis, while lower down they are subdivided into more or less distinct pinnules and are apparently separated from each other, although the basal pinnules are attached to the rachis.

The only difference on the part of our specimen is that the basal pinnules are free; but this may be and probably is due to its representing a yet lower portion of a frond than is depicted in either of Newberry's figures, which in themselves indicate a transition to a base similar to ours.

The reference to the Paleozoic genus *Pecopteris* will doubtless be criticised on general principles, but rather than add to the synonymy I have thought it best to adhere to the name last used by Dr. Newberry.

In grayish sandstone, Walsenberg (?),* Colo.

Stenopteris (?) cretacea sp. nov.

General form of frond unknown, but apparently large and strong; each pinna or branch consisting of a broad-winged rachis, with relatively remote, entire, strap-shaped pinnules, each of which is traversed by a strong midvein from base to apex; secondary nervation unknown.

The fragmentary nature of our specimen renders accurate comparison difficult and it is possible that it might equally well be considered under the genus *Thaumatopteris*, hence the generic reference is questioned.

In reddish shaly sandstone, Florence, Colo.

EXPLANATION OF PLATES

Plate 3. Fig. 1. *Anemia robusta* sp. nov.; Fig. 2. *Stenopteris* (?) *cretacea* sp nov.; Fig. 3. *Gleichenia rhombifolia* sp. nov.; Fig. 4. *Gleichenia delicatula* Heer (?); Figs. 5, 5*a*. *Pecopteris* (*Cheilanthes*) *sepulta* Newb. (?); Figs. 6, 7. *Anemia supercretacea* sp. nov.

Plate 4. Figs. 1, 2. *Asplenium magnum* Knowlton; Figs. 3–6. *Acrostichum Haddeni* sp. nov.; Fig. 7. *Polystichum Hillsianum* sp. nov.

NEW YORK BOTANICAL GARDEN.

* The label denoting the locality was not found, but the matrix is lithologically identical with that of the Walsenberg specimens.